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动物分类学报

中生代晚期原哈格鸣螽化石新发现 (直翅目, 原哈格鸣螽科, 阿博鸣螽亚科)

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摘 要 描述哈格鸣螽科化石 2 新属 7 新种: *Circulaboilus aureus* gen. et sp. nov., *Circulaboilus amoenus* gen. et sp. nov., *Furcaboilus excelsus* gen. et sp. nov., *Aboilus stratosus* sp. nov., *Aboilus cornutus* sp. nov., *Pseudohagala shihi* sp. nov., *Bacharaboilus jurassicus* sp. nov.。标本采自于内蒙古宁城道虎沟中侏罗世九龙山组地层和辽宁西部晚侏罗世义县组地层, 现保存于首都师范大学生命科学学院。
关键词 直翅目, 原哈格鸣螽, 阿博鸣螽亚科, 新属, 新种, 中生代, 中国.
中图分类号 Q915. 819. 7

原哈格鸣螽科 Prophalangopsidae 是直翅目出现的较晚较为进化的类群, 在晚侏罗世到古新世期间取得主导地位, 与更早出现的 Oedishchiodea 和 Haglidae 相比, 它的发声器官发生了很大变化, 一种更有利于隐蔽的发声机制开始逐渐取代最原始的发声机制并取得主导地位, 一些类群的发声器官开始退化 (Gorochov and Rasnitsyn, 2002)。

最近作者自内蒙古宁城道虎沟中侏罗世九龙山组地层 (任东, 2002) 和辽宁西部晚侏罗世义县组地层中采得大量昆虫化石标本, 其中包括了本文描述的 7 件阿博鸣螽亚科化石。本文描述的标本保存于首都师范师范大学昆虫演化与变迁重点实验室。

本文所有线条图均借助于 Leica 显微镜附带绘图臂完成。采用的术语参考 Gorochov 所采用的系统。

原哈格鸣螽科 **Prophalangopsidae Kirby, 1906**

阿博鸣螽亚科 **Aboilinae Martynov, 1925**

Aboilidae Martynov, 1925. *Bull. Aced. Sci. Russie*, 569-598.
Aboilinae Gorochov, 1986. *Trudy Zool. Inst. Akad. Nauk SSSR*, 143: 65-100.
Aboilinae Gorochov, 1988. *Paleontol. Zhurnal*, (2): 54-66.
Aboilinae Gorochov, 1995. Pt. 1. *Trudy Zool. Inst. Ross. Akad*, 260: 126-137.

圆阿博鸣螽, 新属 Circulaboilus **gen. nov.**

模式种: *Circulaboilus aureus* sp. nov.

词源: circul- (源自拉丁 *circuli*-, 圆) + aboilus (Aboilinae 亚科 *aboilus* 属), 阳性。

鉴别特征 雄虫前翅翅面呈椭圆形。Fc 脉长, 呈弧形, 在翅长 1/2 稍后达翅前缘。前缘域较宽。Sc 脉直, 约在翅长 3/4 处达翅前缘, 支脉多于 10 支, 近平行排列。R 脉在翅长 1/2 处分支, R_1 脉和 Rs 脉支脉均较少。R-M 域在翅中部较宽。M-Cu 域基干部略宽于 Sc-R 域基干部。MP+ CuA_1 脉分支略早于 R 脉, 末端 4 支。$1CuA_2$-$2CuA_2$ 域及 $2CuA_2$-CuP 域较宽。

雌虫前翅翅面呈椭圆形。Fc 脉长, 呈弧形, 在翅长 1/2 稍后达翅前缘。前缘域较宽。Sc 脉直, 约在翅长 3/4 处达翅前缘, 支脉少于 10 支, 近平行排列。R 脉在翅长 1/2 处分支, R_1 脉和 Rs 脉支脉均较少。R-M 域较窄。M-Cu 域基干部略宽于 Sc-R 域基干部。MP+ CuA_1 脉分支略早于 R 脉, 末端 4 支。

比较与讨论 新属与 *Bacharaboilus* Gorochov, 1988 较为相似, 但新属 Fc 脉长, 在翅长 1/2 稍后达翅前缘; Sc 脉分支较少; Rs 脉分支点离基部较近且 MP+ CuA_1 脉分支较少。

金黄圆阿博鸣螽, 新种 Circulaboilus aureus **sp. nov.** (图 1, 5)

正模: 一块保存较完整的雄虫前翅标本, 编号: CNU-O-NN-2006022。

词源: "*aureus*" 源自拉丁词, 金黄的。

产地及层位: 内蒙古宁城道虎沟, 九龙山组

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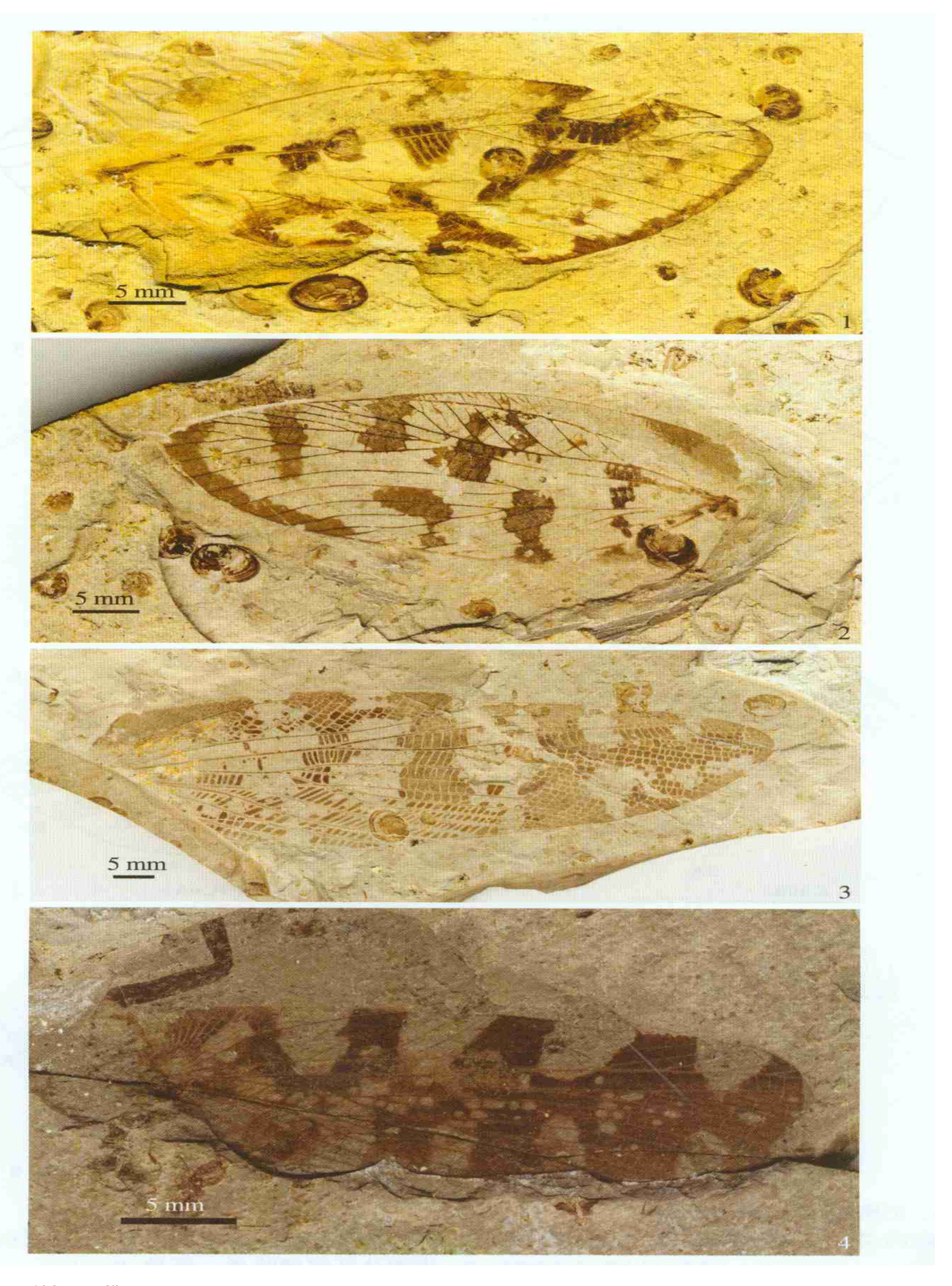


图 1～4 前翅，正模（forewing, holotype）

1. 金黄圆阿博鸣螽，新种 *Circulaboilus aureus* sp. nov. ♂, CNU-O-NN-2006022 2. 美妙圆阿博鸣螽，新种 *Circulaboilus amoenus* sp. nov. ♀, CNU-O-NN-2006023 3. 优秀分叉阿博鸣螽，新种 *Furcaboilus excelsus* sp. nov. ♀, CNU-O-NN-2006109 4. 层状阿博鸣螽，新种 *Aboilus stratosus* sp. nov. ♀, CNU-O-NN-2006010

（中侏罗世）。

描述 雄虫前翅翅长44 mm，翅宽17 mm。翅面呈

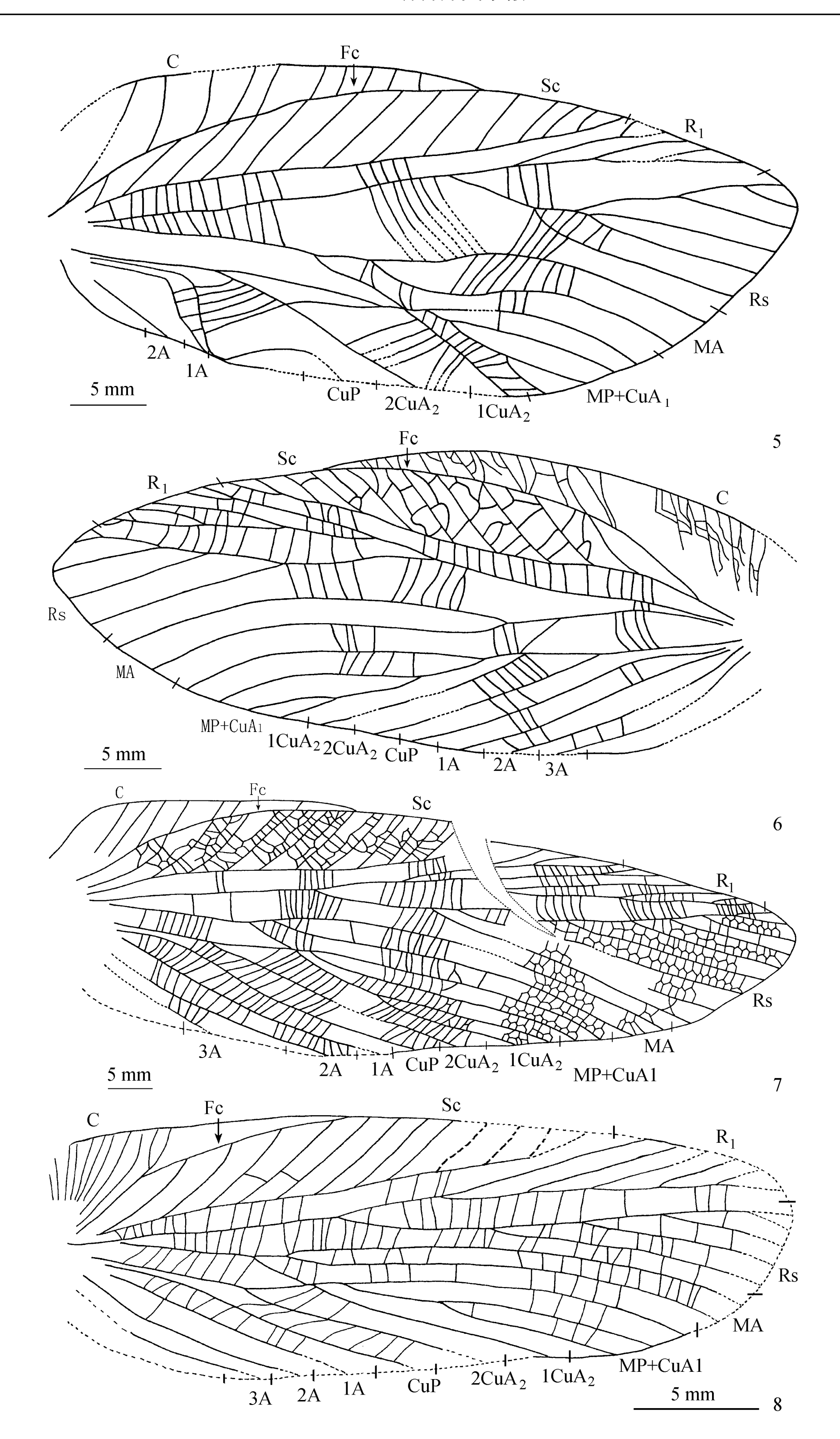


图 5~ 8　前翅, 正模 (forewing, holotype)

5. 金黄圆阿博鸣螽, 新种 *Circulaboilus aureus* sp. nov. ♂, CNU-O-NN-2006022　6. 美妙圆阿博鸣螽, 新种 *Circulaboilus amoenus* sp. nov. ♀, CNU-O-NN-2006023　7. 优秀分叉阿博鸣螽, 新种 *Furcaboilus excelsus* sp. nov. ♀, CNU-O-NN-2006109　8. 层状阿博鸣螽, 新种 *Aboilus stratosus* sp. nov. ♀, CNU-O-NN-2006010

椭圆形。Fc 脉长, 呈弧形, 在翅长 1/2 稍后达翅前缘。前缘域较宽, 其间规则横脉发育。Sc 脉直, 在翅长 3/4 处融于前缘, 支脉 13 支, 近平行排列。R 脉自翅基部发出, 在翅长 1/2 稍后分支, R_1 脉支脉 3 支。Rs 脉在 R_1 脉分支后稍后分支, 支脉 5 支, 近梳状排列。Sc-R 域基干部较宽, 其间规则横脉发育。R_1-Rs 域基干部较宽, 其间规则横脉发育。M 脉自翅基部发出, MA 脉在 R 脉分支前叉状分支, 2 支脉

分出后向下缘略弯, 后又呈弓形分出, 其间规则横脉发育。R-M 域在翅中部较宽, 其间 3 组横脉发育。M-Cu 域基干部与 Sc-R 域基干部近等宽。MP 脉自 MA 脉分支前分出, 与 CuA 脉融合, 合并一段后分出。MP+ CuA_1 脉分支略早于 R 脉, 末端 4 支, 近平行排列。$1CuA_2$ 脉与 $2CuA_2$ 脉平行, $1CuA_2$-$2CuA_2$ 域及 $2CuA_2$-CuP 域较宽, 其间规则横脉发育。CuP 脉近端略呈 S 形, 远端呈弓形。

美妙圆阿博鸣螽, 新种 Circulaboilus amoenus **sp. nov.** (图 2, 6)

正模: 一块保存较完整的雌虫前翅标本, 编号: CNU-O-NN-2006023。

词源: "*amoenus*" 源自拉丁词, 美妙的。

产地及层位: 内蒙古宁城道虎沟, 九龙山组(中侏罗世)。

描述　雌虫前翅翅长 45 mm, 翅宽 18 mm。翅面呈椭圆形, 翅面具斑纹(如图 2)。Fc 脉长, 呈弧形, 在翅长 1/2 稍后达翅前缘。前缘域较宽, 其间不规则横脉发育。Sc 脉直, 约在翅长 3/4 处融于前缘, 支脉 9 支, 近平行排列, 其间不规则横脉发育。R 脉自翅基部发出, 在翅长 1/2 处分支, R_1 脉支脉 3 支, 其间规则横脉发育, 近平行排列。Rs 脉在 R_1 脉第 2 支脉处再分支, 支脉 4 支, 近平行排列。Sc-R 域基干部较窄, 其间规则横脉发育。R_1-Rs 域基干部较较窄, 其间规则横脉发育。M 脉呈弓形自翅基部发出, MA 脉在 R 脉分支前叉状分支, 2 支脉弓形, 近平行排列。R-M 域基干部较窄, 其间规则横脉发育。M-Cu 域基干部宽于 Sc-R 域基干部。MP 脉自 MA 脉分支前分出, 与 CuA 脉融合, 合并一段后分出。MP+ CuA_1 分支略早于 R 脉, 末端 4 支, 近平行排列。$1CuA_2$ 脉与 $2CuA_2$ 脉平行。$1CuA_2$-$2CuA_2$ 域及 $2CuA_2$-CuP 域较窄, 其间规则横脉发育。A 脉 3 支, 近平行排列, 其间规则横脉发育。

比较与讨论　新种与 *Circulaboilus aureus* sp. nov. 相似, 但 *Circulaboilus amoenus* sp. nov. 前缘域不规则横脉发育, Sc 脉支脉 9 支, Rs 脉在 R_1 脉第 2 支脉处分支等特征与后者区别明显。

分叉阿博鸣螽, 新属 Furcaboilus **gen. nov.**

模式种: *Furcaboilus excelsus* sp. nov.

词源: furc (源自拉丁 *furc-*, 分叉) + aboilus (Aboilinae 亚科 *aboilus* 属), 阳性。

鉴别特征: 雌虫前翅 Fc 短, 呈弧形。前缘域较窄, 亚前缘宽阔。Sc 脉直, 支脉多于 10 支。R 脉约在 1/3 处分支, R_1 脉分支较少, Rs 脉分支较多。MP+ CuA_1 脉与 R 脉同时分支, 支脉 2 支。M-Cu 域基干部与 Sc-R 域基干部近等宽。$1CuA_2$ 脉在其中部分支, 末端 2 支。

雄虫: 未知。

比较与讨论　新属与 *Sunoprophanlangopsis* Hong, 1982 较为相似, 但新属 MP+ CuA_1 脉与 R 脉同时分支, 支脉 2 支; $1CuA_2$ 脉在其中部分支, 末端 2 支等特征与其区别明显。新属与 *Tettaboilus* Gorochov, 1988 也较为相似, 但新属 R 脉在翅长 1/3 处分支; R-M 域其间 1 组横脉发育; MP+ CuA_1 脉与 R 脉同时分支, 支脉 2 支; $1CuA_2$ 脉在其中部分支, 末端 2 支等特征与其区别明显。

优秀分叉阿博鸣螽, 新种 Furcaboilus excelsus **sp. nov.** (图 3, 7)

正模: 一块保存较完整的雌虫前翅标本, 编号: CNU-O-NN-2006109。

词源: "*excelsus*" 源自拉丁词, 优秀的。

产地及层位: 内蒙古宁城道虎沟, 九龙山组(中侏罗世)。

描述　雌虫前翅翅长 83 mm, 翅宽 27 mm。翅面成梭形, 具带斑(如图 3)。Fc 短, 呈弧形, 约在翅长 1/3 处达前缘。前缘域较窄, 亚前缘域宽阔。Sc 脉略呈 S 形, 在翅长 4/5 处达翅前缘, 支脉 13 支, 其间不规则横脉发育。R 脉自翅基部发出, 在翅长 1/3 处分支。R_1 脉支脉 4 支, 近平行排列, 其间规则横脉发育。Rs 脉在 R_1 脉分支后稍后再分支, 支脉 8 支, 近梳状排列, 其间不规则横脉发育。Sc-R 域基干部较窄, 其间规则横脉发育。R_1-Rs 域基干部较宽, 其间规则横脉发育。M 脉呈弓形自 R 脉基部发出, MA 脉在翅长 1/3 前叉状分支, 2 支脉弓形, 近平行排列, 其间 2 组横脉发育。R-M 域较窄, 其间 2 组横脉发育。Sc-R 域基干部与 M-Cu 域基干部近等宽。MP 脉自 MA 脉分支前发出, 与 CuA 脉融合, 合并一段后分出, MP+ CuA_1 脉与 R 脉同时分支, 支脉 2 支, 近平行排列, 其间 2 组横脉发育。$1CuA_2$ 脉在其中部分支, 支脉 2 支, 均达翅缘。$1CuA_2$ 脉, $2CuA_2$ 脉及 CuP 脉平行。$1CuA_2$-$2CuA_2$ 域与 $2CuA_2$-CuP 域较窄, 其间规则横脉发育。A 脉 3 支, 其间规则横脉发育。

阿博鸣螽属 Aboilus **Martynov, 1925**

Aboilus Martynov, 1925. *Bull. Acad. Sci. Russie*, 569-598.

模式种: *Aboilus fasciatus* Martynov, 1925.



图 9 角状阿博鸣螽，新种 *Aboilus cornutus* sp. nov.，正模♀ (holotype)，CNU-O-NN-2006019，整体 (body)
图 10 史氏拟阿博鸣螽，新种 *Pseudohagala shihi* sp. nov.，正模♀ (holotype) CNU-O-NN-2006011，前翅 (forewings)

层状阿博鸣螽，新种 Aboilus stratosus **sp. nov.** (图 4，8)

正模：一件保存较好的雌虫前翅标本，编号：CNU-O-NN-2006010。

词源："*stratosus*" 源自拉丁词，层状的。

产地及层位：内蒙古宁城道虎沟，九龙山组（中侏罗世）。

描述　翅长 30 mm，翅宽 10 mm（保存部分）。翅面具深色带斑（如图 4）。Fc 脉略呈弧形，在翅长 1/2前达翅前缘。Sc 脉直，约在翅长 3/4 处达翅前缘，支脉 12 支，近平行排列。R 脉在翅长 1/2 前分支，R_1 脉支脉 5 支。Rs 脉在 R 脉分之后稍后分支，支脉 4 支，近梳状排列。Sc-R 域基干部较窄，有 1 组横脉发育。R-Rs 域基干部较宽。M 脉略呈弓形自 R 脉基部发出，MA 脉于 R 脉分支点前叉状分支，2 支脉弓形，近平行排列，其间 1 组横脉发育。MP 脉在 MA 脉分支点前分出，与 CuA 脉融合，合并一段后分支。M-Cu 域基干部略宽于 Sc-R 域基干部。MP+ CuA_1 脉与 R 脉几乎同时分支，末端 3 支。

比较与讨论　新种与 *Aboilus maculantus* Martynov, 1935 相似，但新种 Sc 支脉 12 支，Rs 脉支脉 4 支，MP+ CuA_1 脉末端 3 支等特征与其区别明显。

角状阿博鸣螽，新种 Aboilus cornutus **sp. nov.**（图 9，12，13）

正模：一件虫体及前翅保存的雌虫前翅标本，编号：CNU-O-NN-2006019。

词源："*cornutus*"源自拉丁词，角状的。

产地及层位：内蒙古宁城，九龙山组（中侏罗世）。

描述　前翅翅长32 mm，翅宽9 mm。Fc 脉略呈弧形，约在翅长 1/3 处融于翅上缘。Sc 脉直，约在翅长 2/3 处达翅前缘，支脉 12 支，近平行排列。R 脉在翅长 1/5 处分支。R_1 脉在翅长 1/3 处再分支，支脉 5 支。Rs 脉在翅长 1/2 前再分支，支脉 6 支，梳状排列。Sc-R 域基干部较窄，有 1 组横脉发育。R-Rs 域基干部较宽，有 1 组横脉发育。M 脉略呈弓形自 R 脉基部发出，MA 脉于 R 脉分支点稍前叉状分支，2 支脉弓形，近平行排列，其间 2 组横脉发育。R-M 域基干部较窄，其间有 2 组横脉发育。MP 脉在 MA 脉分支点前分出，与 CuA 脉融合，合并一段后分支。M-Cu 域基干部宽于 Sc-R 域基干部。MP+ CuA_1 脉与 R 脉同时分支，末端 5 支。

比较讨论　新种与 *Aboilus stratosus* sp. nov. 相

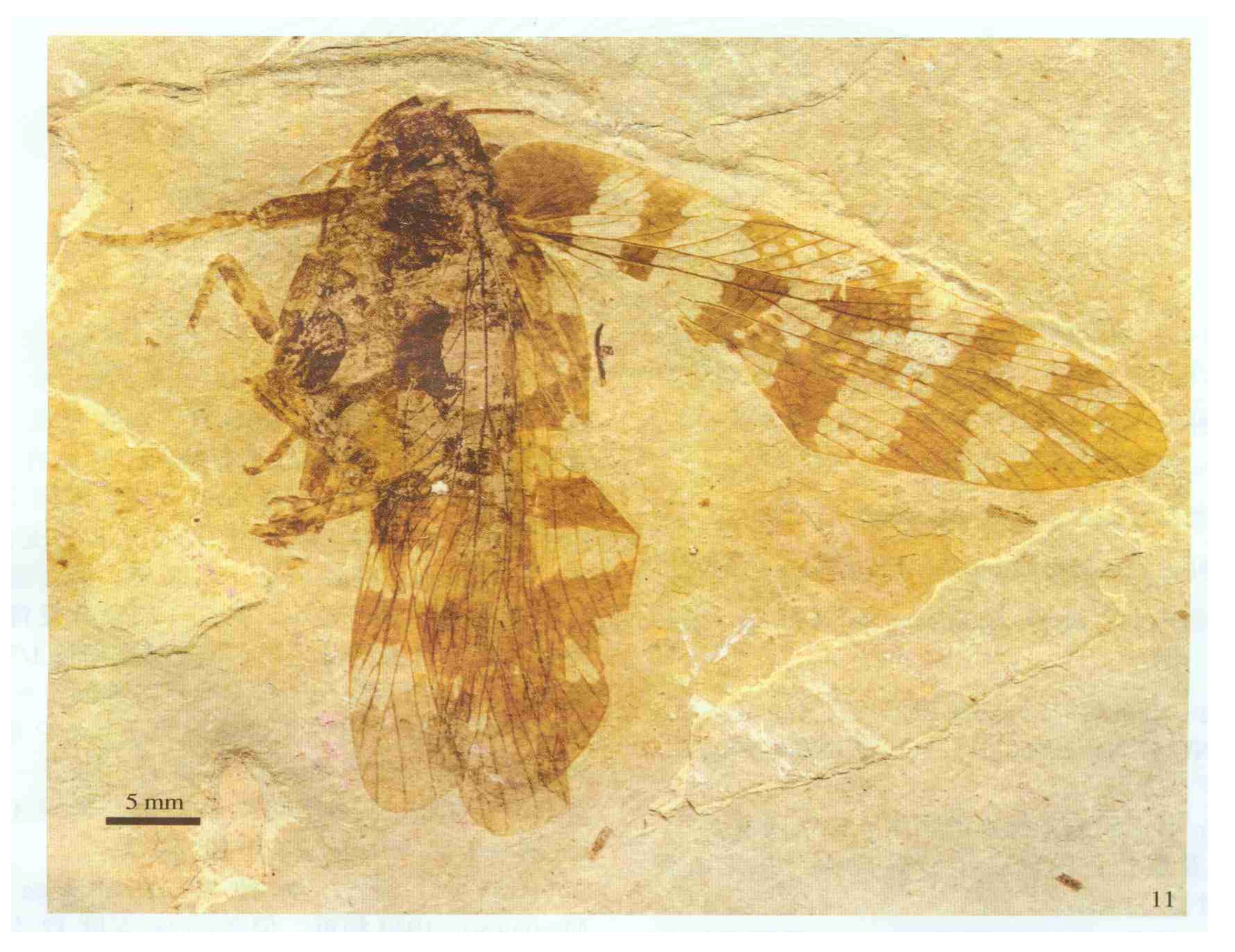


图 11　侏罗巴哈阿博鸣螽，新种 *Bacharaboilus jurassicus* sp. nov.，正模♀（holotype）CNU-O-NN-2006012，整体（body）

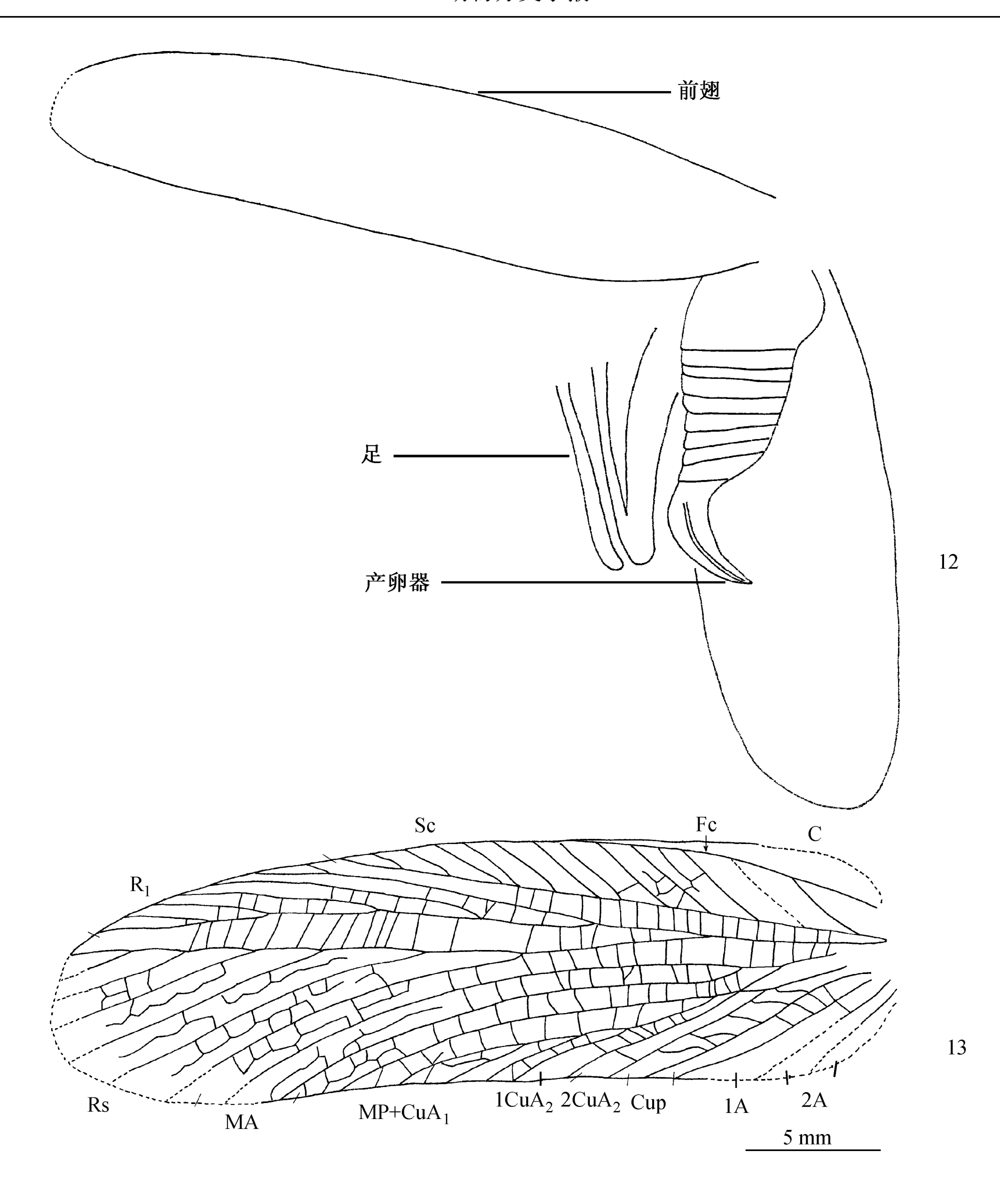


图 12~ 13 角状阿博鸣螽，新种 *Abalus cornutus* sp. nov.
正模♀ (holotype), CNU-O-NN-2006019 12. 前翅 (forewing) 13. 整体 (body)

似，但新种 R 脉在翅长 1/5 处分支，Rs 脉支脉 6 支，MP+ CuA_1 脉末端 5 支等特征与其区别明显。

拟阿博鸣螽属 Pseudohagala **Martynova, 1949**

模式种：*Pseudohagala pospelovi* Martynova, 1949

史氏拟阿博鸣螽，新种 Pseudohagala shihi **sp. nov.** (图 10, 14)

正模：一件保存较好的雌虫前翅标本，正反面。编号：CNU-O-NN-2006011-1，CNU-O-NN-2006011-2。

词源：种名献给本标本的捐赠人史宗冈博士。

产地及层位：内蒙古宁城道虎沟，九龙山组(中侏罗世)。

描述 翅长 36 mm，翅宽 12 mm。翅面具深色带斑。Fc 脉略呈弧形，在翅长 1/3 处达翅前缘。前缘域纵脉放射状排列。Sc 脉直，约在翅长 3/4 处达翅前缘，支脉 14 支，近平行排列。R 脉在翅长 1/4 处分支。R_1 脉在翅长 1/3 处再分支，末端 7 支。Rs 脉主干向下缘微弯，越过翅长 1/2 后再分支，支脉 5 支，梳状排列。Sc-R 域基干部较宽，有 1 组横脉发育。R-Rs 域基干部较窄，其间 1 组横脉发育。M 脉略呈弓形自 R 脉基部发出，MA 脉在翅长 1/3 前叉状分支，2 支脉弓形，近平行排列，其间 2 组横脉发育。R-M 区基干部有 2 组横脉发育。MP 脉在 MA 脉分支点前分出，与 CuA 脉融合，合并一段后分支。MP+ CuA_1 脉分支略早于 R 脉，末端 4 支。M-Cu 域基干部与 Sc-R 域基干部近等宽。

比较讨论 新种与 *Pseudohagala pospelovi* Martynova, 1949 相近，但新种 Sc 支脉 12 支且均为单支，无分叉。R_1 脉 7 支，Rs 脉 5 支。

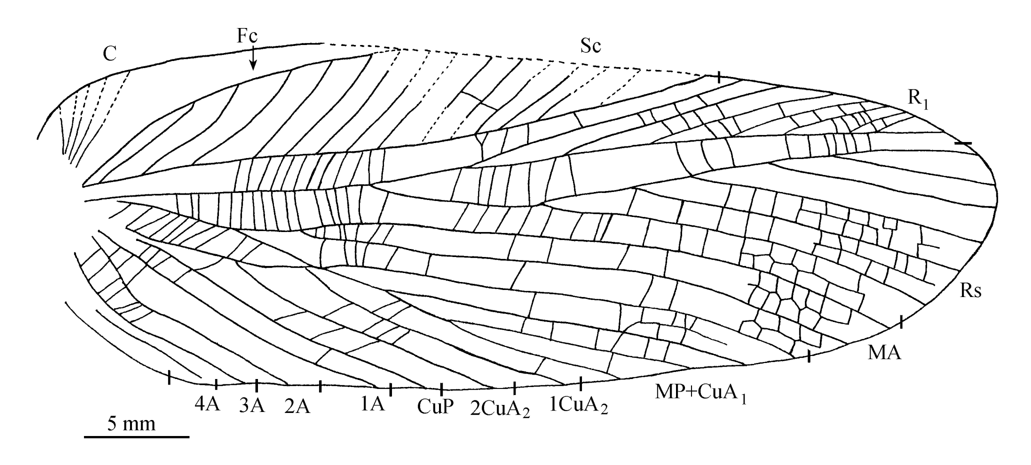


图 14　史氏拟阿博鸣螽，新种 *Pseudohagala shihi* sp. nov.，正模♀（holotype）CNU-O-NN-2006011，前翅（forewing）

C
Fc
Sc
R_1
Rs
MA
15
$MP+CuA_1$
$1CuA_1$
5 mm

触角
前足
中足
16
2 mm

图 15~16　侏罗巴哈阿博鸣螽，新种 *Bacharaboilus jurassicus* sp. nov.，正模♀（holotype）CNU-O-NN-2006012，15. 前翅（forewing）　16. 触角，前足，中足（antenna，fore leg，middle leg）

巴哈阿博鸣螽属 Bacharaboilus **Gorochov，1988**

Bacharaboilus Gorochov，1988. *Paleontol. Zhurnal*.，(2)：54-66.

模式种：*Bacharaboilus mongolicus* Gorochov，1988

侏罗巴哈阿博鸣螽，新种 Bacharaboilus jurassicus **sp. nov.**（图 11，15，16）

正模：一件前翅保存较好，虫体部分保存的雌虫标本。编号：CNU-O-LB-2006012。

词源："*aureus*" 源自地质年代 *Jurassic*。

产地及层位：辽宁北票，义县组（晚侏罗世）。

描述　前翅长 39 mm，翅宽 12 mm（保存部分）。翅面具深色带斑。Fc 脉略成弧形，逐渐向翅上缘靠

拢，在翅长1/2前达翅前缘。Sc脉约在翅长2/3处达翅前缘，支脉9支，近平行排列。前缘区纵脉放射状排列。R脉在翅长1/2前分支，末端4支。Rs脉在R_1支脉第3支脉处分支，支脉4支，梳状排列。Sc-R域基干部较窄，其间1组横脉发育。M脉略呈弓形自R脉基部发出，MA脉于R脉分支点前叉状分支，2支脉弓形，近平行排列，其间1组横脉发育。R-M域基干部较窄，其间1组横脉发育。MP脉自MA脉分支点前分出，与CuA脉融合，合并一段后分支。MP+CuA_1脉分支略早于R脉，末端4支。M-Cu域基干部与Sc-R域基干部近等宽。

比较讨论 新种 *Bacharaboilus mongolious* Gorochov, 1988相似，但新种Sc脉支脉9支；R脉在翅长1/2前分支，支脉4支；MP+CuA_1脉分支略早于R脉，末端4支。

致谢 河北大学生命科学学院石福明教授为研究工作提供了大量资料，还得到王莹，王田田，刘明，孙建海，谭京晶，刘玉双，黄建东等同学的帮助，在此一并表示感谢。

REFERENCES (参考文献)

Gorochov, A. V. 1986. Triassic insects of the Superfamily Hagloidea (Orthoptera). Trudy Zool. Inst. Akad. Nauk SSSR 143 Zool. Inst. Akad. Nauk SSSR, Leningrad. 65-100. (in Russian)

Gorochov, A. V. 1988. The Lower and Middle Jurassic Superfamily Hagloidea (Orthoptera). *Paleont. Jur.*, (2): 50-61.

Gorochov, A. V. 1990. Othottera Gryllida. *In*: Rasnitsyn, A. P. (ed.), Late Mesosoic insects of Eastern Transbaikalia. Trudy Paleontol. Inst. Akad. Nauk SSSR 239 Nauka, Moscow. 210-214. (in Russian)

Gorochov, A. V. 1995. System and Evolution of the Suborder Ensifera (Orthoptera). Pt. 1. Trudy Zool. Inst. Ross. Akad. Nauk 260. Zool. Inst. Ross. Akad. Nauk, St. -Petersburg. 126-137. (in Russian)

Gorochov, A. V. 1996. New Mesozoic insects of the Superfamily Hagloidea (Orthoptera). *Paleontol. Zhurnal*, (3): 73-82 (in Russian).

Gorochov, A. V. 2003. New data on taxonomy and evolution of fossil and Recent Prophalangopsidae (Orthoptera: Hagloidea). *Acta Zoologica Cracoviensia*, 46 (suppl. -Fossil Insects): 117-127.

Hong, Y-C 1982a. Fossil Haglidae (Orthoptera) in China. *Scientia Sinica* (series B), 25 (10): 1118-1129. [洪友崇，1982a. 中国直翅目哈格鸣螽科化石. 中国科学B辑，25 (10): 1118~1129]

Hong, Y-C 1982b. Mesozoic Fossil Insets of Jiuquan Basin in Gansu Province. Geological Publishing House, Beijing. 71-80. [洪友崇，1982b. 酒泉盆地昆虫化石. 北京：地质出版社. 71~80]

Hong, Y-C 1983. Middle Jurassic Fossil Insects in North China. Geological Publishing House, Beijing. 42-48. [洪友崇，1983. 北方中侏罗世昆虫化石. 北京：地质出版社. 42~48]

Hong, Y-C 1984. Mesozoic Volume Ⅱ. *In*: Palaeontological Atlas of North China. Geological Publishing House, Beijing. 148-152. [洪友崇，1984.（二）中生代分册. 华北地区古生物图册. 北京：地质出版社. 148~152]

Hong, Y-C 1986. New fossil insects of Haifanggou Formation, Liaoning Province. *J. Changchun Coll. Geol.*, 4: 10-16. [洪友崇，1986. 辽西海房沟组新的昆虫化石. 长春地质学院学报，4: 10~16]

Hong, Y-C 1990. The stratigraphy and palaeontology of Laiyang Basin, Shandong Province. Geological Publishing House, Beijing. 69-71. [洪友崇，1990. 山东莱阳盆地地层地层古生物. 北京：地质出版社. 69~71]

Hong, Y-C 1992. Middle and Late Jurassic Fossil Insects. *In*: Palaeontological Atlas of Jilin Province. Jilin Science and Technology Publishing House, Changchun. 420-421. [洪友崇，1992. 中晚侏罗世昆虫. 吉林省古生物图册. 长春：吉林科技出版社. 420~421]

Lin, Q-B 1965. Two insects from the Lower Part of Jurassic, Inner Mongolia. *Acta Palaeont. Sin.*, 13 (2): 363-368. [林启彬，1965. 内蒙下部侏罗系的两种昆虫化石. 古生物学报，13 (2): 363~368]

Martynov, A. V. 1925. To the knowledge of fossil insects from Jurassic beds in Turkestan. *Bull. Acad. Sci. Russie*, 569-598.

Ren, D 1995. Fossil Insects Part. *In*: Faunae and Stratigraphy of Jurassic Cretaceous in Beijing and the Adjacent areas. Earthquake Publishing House, Beijing. 61-65. [任 东，1995. 昆虫化石部分. 北京与邻区侏罗-白垩纪动物群及其地层. 北京：地震出版社. 61~65]

Ren, D 2002. Stratigraphic division of the Jurassic in the Daohugou area, Ningcheng, Inner Mongolia. *Geological Bulletin of China Sinica*, 21 (8-9): 584-591. [任 东，2002. 内蒙古宁城道虎沟地区侏罗纪地层划分及时代探讨. 地质通报，21 (8~9): 584~591]

Sharov, A. G. 1968. Phylogeny of the Orthopteroidea. Trudy Paleontol. Inst. Akad. Nauk SSSR 118. Nauka, Moscow. 218 p. (in Russian)

NEW PROPHALANGOPSIDS FROM LATE MESOZOIC OF CHINA (ORTHOPTERA, PROPHALANGOPSIDAE, ABOILINAE)

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Abstract In this paper two new genera and seven new species were described: *Circulaboilus aureus* gen. *et* sp. nov., *Circulaboilus amoenus* gen. *et* gen. nov., *Furcaboilus excelsus* gen. *et* sp. nov., *Aboilus stratosus* sp. nov., *Aboilus cornutus* sp. nov., *Pseudohagala shihi* sp. nov. and *Bacharaboilus jurassicus* sp. nov. All of them were collected from Middle Jurassic, Jiulongshan Formation, Daohugou Village, Ningcheng Country, Inner Mongolia and Late Yixian Formation, Liaoning Province, China. Type specimens are deposited in Capital Normal University.

Circulaboilus **gen. nov.**

Type species: *Circulaboilus aureus* sp. nov.

Etymology. Circul- (from Latin *circuli-*, means round) + aboilus (name of genus *aboilus*), masculine.

Diagnosis. Male, forewing oval. Fc long, arched, fused with precostal after 1/2 of the wing length. Precostal field broad. Sc straight, extending at about 3/4 of the wing length, with more than 10 branches leading to the anterior margin. R forked at about 1/2 of the wing length, R_1 with 3 branches, Rs with 5 branches. R-M field wided at the medium of the wing. The basal part of

M-Cu field wider than the basal part of Sc-R field. MP+ CuA_1 forked earlier than R, with 4 branches. $1CuA_2$-$2CuA_2$ region and $2CuA_2$-CuP region wide.

Female. Forewing oval. Fc long, arched, fused with precostal after 1/2 of the wing length. Precostal field broad. Sc straight, extending at about 3/4 of the wing length, with less than 10 branches leading to the anterior margin. R forked at 1/2 of wing length, R_1 with 3 branches, Rs with 4 branches. R-M area narrow. The basal part of M-Cu field wider than the basal part of Sc-R field. MP + CuA_1 forked earlier than R, with 4 branches.

Discussion. The new genus is similar to *Bacharaboilus* Gorochov, 1988, but it should be distinguished from the latter in following characters: Fc long, fused with precostal at about 1/2 of the wing length, Sc with few branches, Sc-R field wide, Rs beginning to branch near its base, MP+ CuA_1 with less branches.

Circulaboilus aureus **sp. nov.** (Figs. 1, 5)

Holotype. A well preserved male forewing, registration No: CNU-O-NN-2006022.

Etymology. "*Aureus*" from Latin, means golden.

Locality and horizon. Daohugou Village, Ningcheng Country, Inner Mongolia. Middle Jurassic, Jiulongshan Formation.

Description. Forewing length 44 mm, width 17 mm. Fc long, arched, fused with precostal after 1/2 of the wing length. Sc straight, extending at about 3/4 of the wing length, with 13 parallel branches leading to the anterior margin. R forked after 1/2 of the wing length, with 3 branches. Rs with 5 branches. MP+ CuA_1 forked earlier than R, with 4 branches. $1CuA_2$-$2CuA_2$ field and $2CuA_2$-CuP field wide.

Circulaboilus amoenus **sp. nov.** (Figs. 2, 6)

Holotype. A well preserved male forewing, registration No: CNU-O-NN-2006023.

Etymology. "*Amoenus*" from latin, means wonderful.

Locality and horizon. Daohugou Village, Ningcheng Country, Inner Mongolia. Middle Jurassic, Jiulongshan Formation.

Description. Forewing length 45 mm, width 18 mm. Fc long, arched, fused with precostal after 1/2 of the wing length. Sc straight, extending at about 3/4 of the wing length, with 9 parallel branches leading to the anterior margin. R forked at 1/2 of the wing length, with 3 branches. Rs forked at second branch of R_1, with 4 branches. MP + CuA_1 forked earlier than R, with 4 branches. $1CuA_2$-$2CuA_2$ field and $2CuA_2$-CuP field narrow. Discussion. The new species is similar to *Circulaboilus aureus* sp. nov., but it could be distinguished in following characters: precostal field with anomaly cross-vein, Sc with 9 branches, Rs with 4 branches, Rs forked at the second branch of R_1.

Furcaboilus **gen. nov.**

Type species: *Furcaboilus* excelsus sp. nov.

Etymology. Furc (from Latin *furc-*, means branch off) + aboilus (name of genus *aboilus*), masculine.

Diagnosis. Female forewing, Fc short, arched. Precostal area narrow, costal area wide. Sc straight, with more than 10 branches. R forked at about 1/3 of the wing length, R_1 with 4 branches. Rs with 8 branches. MP+ CuA_1 and R forked at the same level, with 2 branches, $1CuA_2$ forks at its medium, with 2 branches.

Male, unknown.

Discussion. New genus is similar to *Sunoprophanlangopsis* Hong, 1982, but it different from the latter in following characters: MP+ CuA_1 and R forked at the same level, with 2 branches; $1CuA_2$ forks at its medium, with 2 branches. New genus is also similar to *Tettaboilus* Gorochov, 1988, however, it could be distinguished from the latter by following characters: R forked at 1/3 of the wing length; R-M area with one kind of cross-vein; MP + CuA_1 and R forked at the same level, with 2 branches; $1CuA_2$ forks at its medium, with 2 branches.

Furcaboilus excelsus **sp. nov.** (Figs. 3, 7)

Holotype. A well preserved female forewing, registration No: CNU-O-NN-2006109.

Etymology. "*Excelsus*" from Latin, means excellent.

Locality and horizon. Daohugou Village, Ningcheng Country, Inner Mongolia. Middle Jurassic, Jiulongshan Formation.

Description. Forewing length 83 mm, width 27 mm. Fc short, arched, fused with precostal at about 1/3 of the wing length. Sc S-shaped, extending at about 4/5 of the wing length, with 13 parallel branches leading to the anterior margin. R forked at 1/3 of the wing length, with 4 branches. Rs with 8 branches. MP + CuA_1 and R forked at the same level, with 2 branches. $1CuA_2$ forks at its medium, with 2 branches. $1CuA_2$-$2CuA_2$ field and $2CuA_2$-CuP field narrow.

Aboilus stratosus **sp. nov.** (Figs. 4, 8)

Holotype. A well preserved female forewing, registration No: CNU-O-NN-2006010.

Etymology. "*Stratosus*" from Latin, means stratum.

Locality and horizon. Daohugou Village, Ningcheng Country, Inner Mongolia. Middle Jurassic, Jiulongshan Formation.

Description. Forewing length 30 mm, width 10mm. Fc short, arched, fused with precostal before 1/2 of the forewing length. Sc straight, extending about 3/4 of the wing length, with 12 parallel branches. R forks before 1/2 of the wing length, with 5 branchs. Rs with 4 branches. The basal part of M-Cu field wider than the

basal part of Sc-R field. MP+ CuA_1 and R forked at the same level, with 3 branches. Discussion. The new species was similar to the Aboilus maculantus, 1935, but it could be distinguish from it by following characters: Sc with 12 branches, Rs with 4 branches, MP+ CuA_1 with 3 branches.

Aboilus cornutus **sp. nov.** (Figs 9, 12, 13)

Holotype. A well preserved female body with forewings, registration No: CNU-O-NN-2006019.

Etymology. " *Cornutus* " from Latin, means cornuted.

Locality and horizon. Daohugou Village, Ningcheng Country, Inner Mongolia. Middle Jurassic, Jiulongshan Formation.

Description. Forewing length 32 mm, width 9 mm. Fc arched, fused with precostal at about 1/3 of the forewing length. Sc straight, extending about 2/3 of the wing length, with 12 parallel banches. R forked at 1/5 of the wing length, with 5 branches. Rs with 6 branches. The basal part of M-Cu field wider than the basal part of Sc-R field. MP+ CuA_1 and R forked at the same level, with 5 branches.

Discussion. The new species is silimlar to the Aboilus stratosus, 2006, but it was different from it in following characters: R forked at 1/5 of the wing length, Rs with 6 branches, MP+ CuA_1 with 5 branches.

Pseudohagala shihi **sp. nov.** (Figs. 10, 14)

Holotype. A well preserved female body with forewings, registration No: CNU-O-NN-2006011-1, CNU-O-NN-2006011-2.

Etymology. " Shihi" named after Dr. Chungkun Shih who donated the fossil.

Locality and horizon. Daohugou Village, Ningcheng Country, Inner Mongolia. Middle Jurassic, Jiulongshan Formation.

Description. Forewing length 36 mm, width 12 mm. Fc arched, fused with precostal at about 1/3 of the forewing length. Sc straight, extending about 3/4 of the wing length, with 14 parallel banches. R forked at 1/4 of the wing length, with 7 branches. Rs with 5 branches. The basal part of M-Cu field as wide as the basal part of Sc-R field. MP+ CuA_1 forked earlier than R, with 4 branches.

Discussion. The new species is similar to Pseudohagala pospelovi Martynova, 1949, but was different from it in following characters: Sc with 12 branches, with 7 branches, Rs with 5 branches.

Bacharaboilus jurassicus **sp. nov.** (Figs. 11, 15-16)

Holotype. A well preserved female body with partial forewings, registration No: CNU-O-NN-2006012.

Etymology. From geological time.

Locality and horizon. Late Jurassic, Yixian Formation, Beipiao City, Liaoning Province.

Description. Forewing length 39 mm, width 12 mm (as preserved). Fc arched, fused with precostal before 1/2 of the forewing length. Sc straight, extending about 2/3 of the wing length, with 9 parallel banches. R forked before 1/2 of the wing length, with 4 branches. Rs with 4 branches. The basal part of M-Cu field as wide as the basal part of Sc-R field. MP+ CuA_1 forked earlier than R, with 4 branches. Discussion. The new species is similar to Bacharaboilus mongolious Gorochov, 1988, but it was different from it in following characters: Sc with 4 branches, R forked before 1/2 of the wing length, with 4 branches, MP+ CuA_1 forked earlier than R, with 4 branches.

Key words Orthoptera, Prophalangopsidae, Aboilinae, new genus, new species, Mesozoic, China.